ABSTRACT OF THE DISCLOSURE

The present invention is generally directed to various methods of using ion implantation techniques to control various metal formation processes. In one illustrative embodiment, the method comprises forming a metal seed layer above a patterned layer of insulating material, the patterned layer of insulating material defining a plurality of field areas, deactivating at least a portion of the metal seed layer in areas where the metal seed layer is positioned above at least some of the field areas, and performing a deposition process to deposit a metal layer above the metal seed layer. In some embodiments, the metal may be comprised of copper, platinum, nickel, tantalum, tungsten, cobalt, etc. Portions of the metal seed layer may be deactivated by implanting ions into portions of the metal seed layer positioned above at least some of the field areas. The implanted ions may be comprised of nitrogen, carbon, silicon, hydrogen, etc. In yet another illustrative embodiment, the system comprises a stencil mask implant tool for implanting ions into selected areas of a metal seed layer formed above a patterned layer of insulating material that defines a plurality of field areas, the ions being implanted into areas of the metal seed layer positioned above at least some of the field areas.